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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
SHIVERS, ASHLEY L	

ART UNIT	PAPER NUMBER
2609	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/829,261	DENG ET AL.	
	Examiner	Art Unit	
	Ashley L. Shivers	2609	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-17 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-17 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 22 April 2004 is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The abstract of the disclosure is objected to because

-- line 7 "a" should be removed after transferring.

-- line 12 "a" should be removed after through.

-- line 14 "signal" should be "signals".

Correction is required. See MPEP § 608.01(b).

2. The disclosure is objected to because of the following informalities:

-- page 2 line 3, a "the" should be inserted between by and user.

-- page 2 line 4 the "to" should be removed after frequencies.

-- page 2 lines 7-10 beginning with "In 1998... " and ending with "pg. 315-335)" is not a sentence.

-- page 5 lines 12 "transmitting" should be "transmits".

-- page 6 line 2 and page 7 line 3 "signal" should be "signals".

-- page 6 line 5 "outputted" should be "outputting".

-- page 6 line 10 the "a" after transferring should be removed.

-- page 6 line 12 "block" should be "blocks".

-- page 6 line 17 the "a" should be removed.

-- page 8 line 24 "steam" should be "streams".

-- page 8 line 24 "user" should be "users".

-- page 9 line 4 and page 12 line 4 "outputted" should be "output".

-- page 9 line 7 a "the" should be inserted after has.

-- page 9 line 15 "through" should be inserted after passed.

-- page 10 line 3 "(1)whe" should be moved to line 4.

-- page 12 line 9 a "to" should be inserted after added.

-- page 12 line 14 "a" should be inserted after needs.

-- page 15 line 13 "antenna" should be "antennas".

--page 16 line 6 "the" should be inserted after using.

-- page 16 line 22 "=" should be "-".

-- page 16 line 22 "spreader" should be "spreaders".

-- page 17 line 16 "requirement" should be "requirements".

Appropriate correction is required.

Drawings

3. The drawings are objected to because Fig. 1a, 2, and 3 show FFT but should be changed to IFFT. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

4. Claims 3-5, 8, 11, 13, 14, 16, and 17 are objected to because of the following informalities:

-- In claim 3 "the" should be inserted between of and sets.

-- In claim 4 the "the" after with should be removed.

-- In claim 5 "firstly" should be "first".

-- In claim 5 "added a guard time" should be "a guard time is added".

-- In claim 8 "outputted" after data should be "output".

-- In claim 8 "signal" after interfering should be "signals".

-- In claim 11 "by" should be inserted after matched.

-- In claim 13 "spreaders" should be "spreader".

-- In claim 14 "a" should be removed after transferring.

-- In claim 14 "a" should be removed after through.

-- In claim 16 "group" should be "groups".

-- In claim 17 "signal" should be "signals".

Appropriate correction is required.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1-3, 6, 7, 10 and 14-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Helmut Bölcskei and Arogyaswami Paulraj's "**Multi-Input Multiple-Output (MIMO) Wireless Systems**", hereinafter referred to as Bölcskei, in view of Roya Doostnejad, Teng Joon Lim, and Elvino Sousa's "**Space Time Spreading Codes for a Multiuser MIMO System**", hereinafter referred to as Doostnejad.

Regarding claim 1, Bölcskei teaches a structure of a multi-input multi-output multicarrier code division multiple access (MIMO MC-CDMA) communication system comprising at least one transmitter and at least one receiver (**See Section 90.1 Diversity Gain p5 lines 1-3**), the transmitter comprising:

a de-multiplexer for receiving a user's data and outputting the data divided into a plurality of parallel data streams (**See Section 90.4 Spatial Multiplexing p2 lines 1-2 and Figure 90.3**);

a plurality of space time block encoders individually receiving the parallel data streams of the de-multiplexer (**See Section 90.4 Spatial Multiplexing p2 lines 1-2**) and outputting the data streams after encoding (**See Section 90.5 Direct Transmit Diversity p3 lines 1-2**); and

Bölcskei fails to teach of the space-path spreaders and the plurality of transmit antennas.

Doostnejad teaches:

a plurality of space-path spreaders receiving outputted data from the space time block encoders and outputting received data after spreading with a pre-designed space-path spreading code (**See Section 1 Introduction p2 and p3**); and

a plurality of transmit antennas, each transmit antenna receives outputted data from each space-path spreader and transmitting received data through multiple paths (**See Section 2 Spreading Matrix Design p2 lines 9-13**).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention, to modify the structure of Bölcskei to include data being spread by space-path spreaders taught by Doostnejad in order to reduce the bandwidth being used.

Regarding claim 2, Bölcskei further teaches the structure of the communication system of claim 1, wherein the de-multiplexer receives the user's data (**See Section 90.4 Spatial Multiplexing p2**), each user's data is proceeded with the de-multiplexer (**See Section 90.4 Spatial Multiplexing p2**), the space time block encoders (**See Section 90.5 Direct Transmit Diversity p3**), and the proceeded user's data are collected at the transmit antennas and transmitted with the transmit antennas (**See Section 90.1 Multiplexing Gain**).

Bölcskei does not specifically teach of sets of user's data being received or of the space-path spreaders.

Doostnejad teaches of receiving sets of user's data and space-path spreaders (**See Section 2 Spreading Matrix Design p2 line 1 and See Section 1 Introduction p2 and p3 as mentioned above in claim 1**).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention, to modify the structure of Bölcskei to include sets of user's data in order to increase the sampling size. The motivation for adding the space-path spreaders is indicated above in claim 1.

Regarding claim 3, Bölcskei further teaches the method of claim 2, wherein the structure comprises the de-multiplexer, the space time block encoders and the space-path spreaders.

Bölcskei does not specifically teach of groups of user's data composed of the components or being used for proceeding the sets of the user's data.

Doostnejad teaches of the users being partitioned into groups and of the space-path spreaders (**See Section 2 Spreading Matrix Design p2 line 1 and See Section 1 Introduction p2 and p3 as mentioned above in claim 1**).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention, to modify the structure of Bölcskei to include groups of user's data in order to provide for a more diverse sampling. The motivation for adding the space-path spreaders is indicated in claim 1 above.

Regarding claim 6, Bölcskei further teaches the structure of the communication system of claim 1, wherein the communication system is a wireless transceiver system **(See Section 90.1 Introduction)**.

Regarding claim 7, Bölcskei further teaches the structure of the communication system of claim 6, wherein the transmitter is one of a base station **(See Section 90.1 Diversity Gain p4)**.

Regarding claim 10, Bölcskei further teaches the structure of the communication system of claim 1, wherein the receiver is a mobile station of a wireless communication system **(See Section 90.1 Introduction)**.

Regarding claim 14, Bölcskei teaches a multi-input multi-output multicarrier code division multiple access (MIMO MC-CDMA) communication method comprising a step of transmitting data and a step of receiving data, the step of transmitting data comprising **(See Section 90.1 Diversity Gain p5 lines 1-3)**:

simultaneously transferring transmitting data to a plurality of parallel data streams **(See Section 90.4 Spatial Multiplexing p2)**;

space time block encoding each parallel data stream **(See Section 90.4 Spatial Multiplexing p2 lines 1-2 and Section 90.5 Direct Transmit Diversity p3 lines 1-2)**; and

Bölcskei fails to teach of the space-path spreaders and the plurality of transmit antennas.

Doostnejad teaches:

spreading the encoded data streams with a pre-designed space-path spreading code (**See Section 1 Introduction p2 and p3**); and

collecting the spread parallel data streams, transferring to a plurality of transmit antennas, and transmitting data with the transmit antennas through multiple paths (**See Section 2 Spreading Matrix Design p2 lines 9-13**).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention, to modify the method of Bölcskei to include data being spread by space-path spreaders taught by Doostnejad in order to reduce the bandwidth being used.

Regarding claim 15, Bölcskei further fails to utilize multiple users.

Doostnejad teaches of the transmitting data coming from a plurality of users (**See Section 1 Introduction p3**).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention, to modify the method of Bölcskei to include multiple users taught by Doostnejad in order to allow for a better sampling of transmitted data.

Regarding claim 16, Bölcskei further fails to teach of the transmitting data being sorted by different users and being transferred to different groups to be transmitted out through multiple paths.

Doostnejad teaches that the transmitting data is sorted by different users and transferred to the parallel data streams of different groups, and data of all parallel data streams is collected to transmit out with the transmit antennas through multiple paths after space time block encoding and spreading with the pre-designed space-path spreading code (**See Section 2 Spreading Matrix Design p2 lines 1-13**).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention, to modify the method of Bölcskei to include data being sorted by different users and collected to transmit out through multiple paths after encoding and spreading taught by Doostnejad in order to provide diversity.

7. Claims 4, 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bölcskei in view of Doostnejad and in further view of Ian Oppermann's "**CDMA Space-Time Block Coding Using an LMMSE Receiver**", hereinafter referred to as Oppermann.

Regarding claim 4, Bölcskei in view of Doostnejad teaches the limitations of the structure of the communication system of claim 3, but fails to teach of multiple and orthogonal space-path spreading codes.

Oppermann teaches that each user's data is spread with the different and orthogonal space-path spreading codes (**See Section 2 System Model p2 lines 3-6 and See Section 2 System Model p3 lines 3-7**)

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention, to modify the structure of Bölcskei in view of Doostnejad to include orthogonal space-path spreading codes taught by Oppermann in order to provide maximum transmission of the data.

Regarding claims 12 and 13, Bölcskei in view of Doostnejad teaches the structure of the communication system of claim 1, but fails to teach of the encoder being connected to the space-path spreader by group or to more than one space-path spreader.

Oppermann implies that the space time block encoder is connected to the space-path spreader by group or is connected to more than one space-path spreaders (**implied because there are multiple spreaders; See Section 2 System Model p2 lines 3-6**).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention, to modify the structure of Bölcskei in view of Doostnejad to include the encoder being connected to the space-path spreader by group or being connected to more than one space-path spreader taught by Oppermann in order to provide for maximum transmission during diversity gain.

8. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bölcskei in view of Doostnejad and in further view of Kaku et al (**U.S. PGPub No. 2003/0007190**), hereinafter referred to as Kaku.

Regarding claim 5, Bölcskei in view of Doostnejad teaches the structure of the communication system of claim 1, but fails to teach of the data first being transformed to the time domain and the adding of a guard time.

Kaku teaches of the data being transferred to the transmit antennas after first being transformed to a time domain data with inverse fast Fourier transform (IFFT) and having a guard time added (**See Figure 1, 105**).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention, to modify the structure of Bölcskei in view of Doostnejad to include the data being transferred to the time domain and adding a guard time and transformed by FFT and removing the guard time taught by Kaku in order to improve performance against synchronization errors and maintain orthogonality conditions.

9. Claims 8, 11 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bölcskei in view of Doostnejad and in further view of Ezio Biglieri's "**Coding for the Wireless Channel**", hereinafter referred to as Biglieri, and Howard Huang, Harish Viswanathan's, and G. J. Foschini's "**Achieving High Data Rates in CDMA Systems Using BLAST Techniques**", hereinafter referred to as Huang.

Regarding claim 8, Bölcskei in view of Doostnejad further teaches the structure of the communication system of claim 1, wherein the receiver comprises a multiplexer receiving data output by the BLAST detector and outputting data after multiplexing (**See Section 90.1 Multiplexing Gain p1 lines 1-5**).

Bölcskei in view of Doostnejad fails to teach of the other receiver components.

Biglieri teaches the structure of the communication system of claim 1, wherein the receiver comprises:

a plurality of receive antennas for receiving data transmitted by the transmit antennas (**See Figure 6.5**);

a space-time linear combiner receiving data despread by the matched filters and outputting received data after combining (**See Section 6.4.4.1 Delay Diversity and 6.4.4.2 Alamouti Scheme**);

a BLAST detector receiving data output by the space-time linear combiner, separating mutually interfering signals from the multiple transmit antennas, obtaining diversity gain, and outputting operated data (**See Section 6.4.6 BLAST Architecture p3**).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention, to modify the structure of Bölcskei in view of Doostnejad to include a plurality of receive antennas, a space-time linear combiner and a BLAST detector taught by Biglieri in order to provide diversity, to allow for equalization to recover the original signals, and to use ordinary modulation and coding techniques to realize a significant fraction of the theoretical capacity.

Bölcskei in view of Doostnejad and Biglieri fails to teach of the matched filters.

Huang teaches of a plurality of matched filters individually receiving data received by the receive antennas and despreading it in accordance with the space-path spreading code (**See Section IV Detection Technique p1**);

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention, to modify the structure of Bölcskei in view of Doostnejad and Biglieri to include matched filters taught by Huang in order to and to maximize the output of the signal-to-noise ratio and output a single channel.

Regarding claim 11, Bölcskei in view of Doostnejad, Biglieri and Huang teaches of the structure of the communication system of claim 8. Bölcskei further fails to teach of the receiver receiving only the data matched by the spreading code.

Doostnejad teaches of the receiver only receiving data matched by the pace-path spreading code of the receiver (**See Section 2 Spreading Matrix Design p2 lines 9-13**).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention, to modify the structure of Bölcskei to include the receiver only receiving the data matched by the space-path spreading code taught by Doostnejad in order to provide diversity gain.

Regarding claim 17, Bölcskei in view of Doostnejad teaches the method of claim 14, step of the receiving data comprising outputting data after multiplexing it with a multiplexer **(See Section 90.1 Multiplexing Gain p1 lines 1-5)**.

Bölcskei in view of Doostnejad fails to teach of the other components of the receiver.

Biglieri teaches the communication method of claim 14, steps of receiving data comprising:

receiving data transmitted by the transmit antennas through a plurality of receive antennas **(See Figure 6.5)**;

combining the despread data with a linear combiner **(See Section 6.4.4.1 Delay Diversity and 6.4.4.2 Alamouti Scheme)**;

separating mutually interfering signals from the combined data with a BLAST detector, and outputting data after multiplexing it with a multiplexer **(See Section 6.4.6 BLAST Architecture p3)**.

Huang teaches of despreading data received by the receive antennas through a plurality of corresponding matched filters in accordance with the pre-designed space-path spreading code (**See Section IV Detection Technique p1**).

The motivation to combine the above references is indicated in claim 8.

10. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bölcskei in view of Doostnejad and in further view of Biglieri, Huang, and Kaku.

Regarding claim 9, Bölcskei in view of Doostnejad, Biglieri and Huang teaches of the structure of the communication system of claim 8 but fails to teach of the received data being transferred to the matched filters after taking FFT and removing the guard time.

Kaku teaches of the data received by the receive antennas being transferred to the matched filters after taking fast Fourier transform (FFT) and removing guard time of data (**See Figure 1, 112**).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention, to modify the method of Bölcskei in view of Doostnejad, Biglieri and Huang to include the data being transferred to the time domain and adding a guard time and transformed by FFT and removing the guard time taught by Kaku in order to improve performance against synchronization errors and maintain orthogonality conditions.

Conclusion

11. Any response to this action should be **faxed** to (571)273-8300 or **mailed** to:

Commissioner of Patents,
P.O. Box 1450
Alexandria, VA 223103-1450

Hand delivered responses should be brought to:
Customer Service Window
Randolph Building
401 Dulany Street
Alexandria, VA 22314

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ashley L. Shivers whose telephone number is (571) 270-3523. The examiner can normally be reached on Monday-Thursday 8:30-7:00 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benny Tieu can be reached on (571) 272-7490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

AS

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